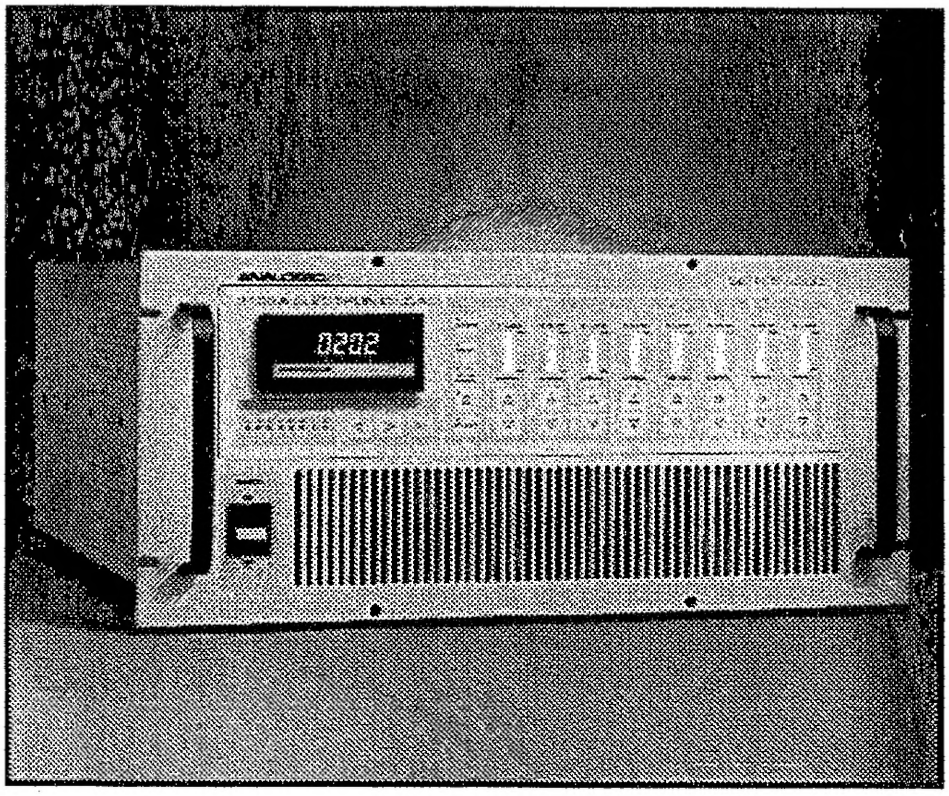
Series 2000 - Model 2103 Electronic Load



USER'S MANUAL

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for Precision Signal Technology

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Table of Contents

LIST OF FIGURES

Chapter 1
Introduction and Overview

Description

The Model 2103A Electronic Load is a self-contained modular DC load which provides a flexible cost effective solution for many power test applications. Combined with a programmable AC source and some supervisory software/PC computer, it becomes a "mini-tester" for multiple output switching and linear power supplies. The 2103A contains a sophisticated new control and measuring system which may be operated via the front panel or reported over the GPIB bus with an optional IEEE-488 interface. Available with 8 channels, this unit is an ideal solution for high volume burn-in applications. In addition to constant current and constant resistance modes of operation, the 2103A has some dynamic capabilities.

Capabilities

The multi-channel electronic load unit is available with 8 channels. Each channel provides up to 50 amps, 250 watts with voltages ranging between 4 to 150 VDC and is independently configurable. Two basic modes of operation are available on each channel: constant current and constant resistance. Load configuration options allow the user to define exactly what is needed for a particular test problem. Fox example, constant current and constant resistance modes as well as external modulation are user selectable.

Channels may be paralleled to increase the current handling capability to 400 amps or 2000 watts per electronic load.

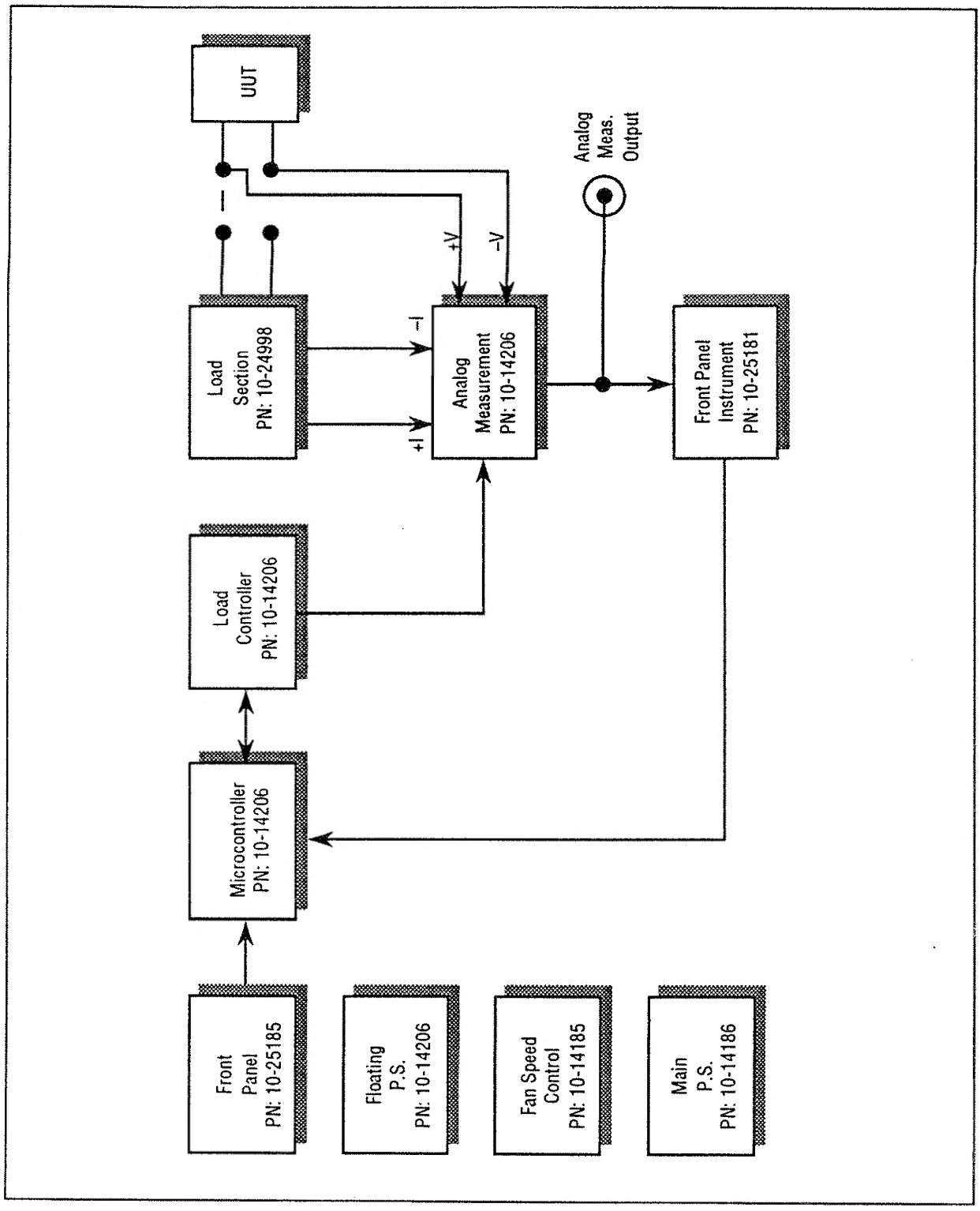


Figure 1-1. Model 2103A System Block Diagram.

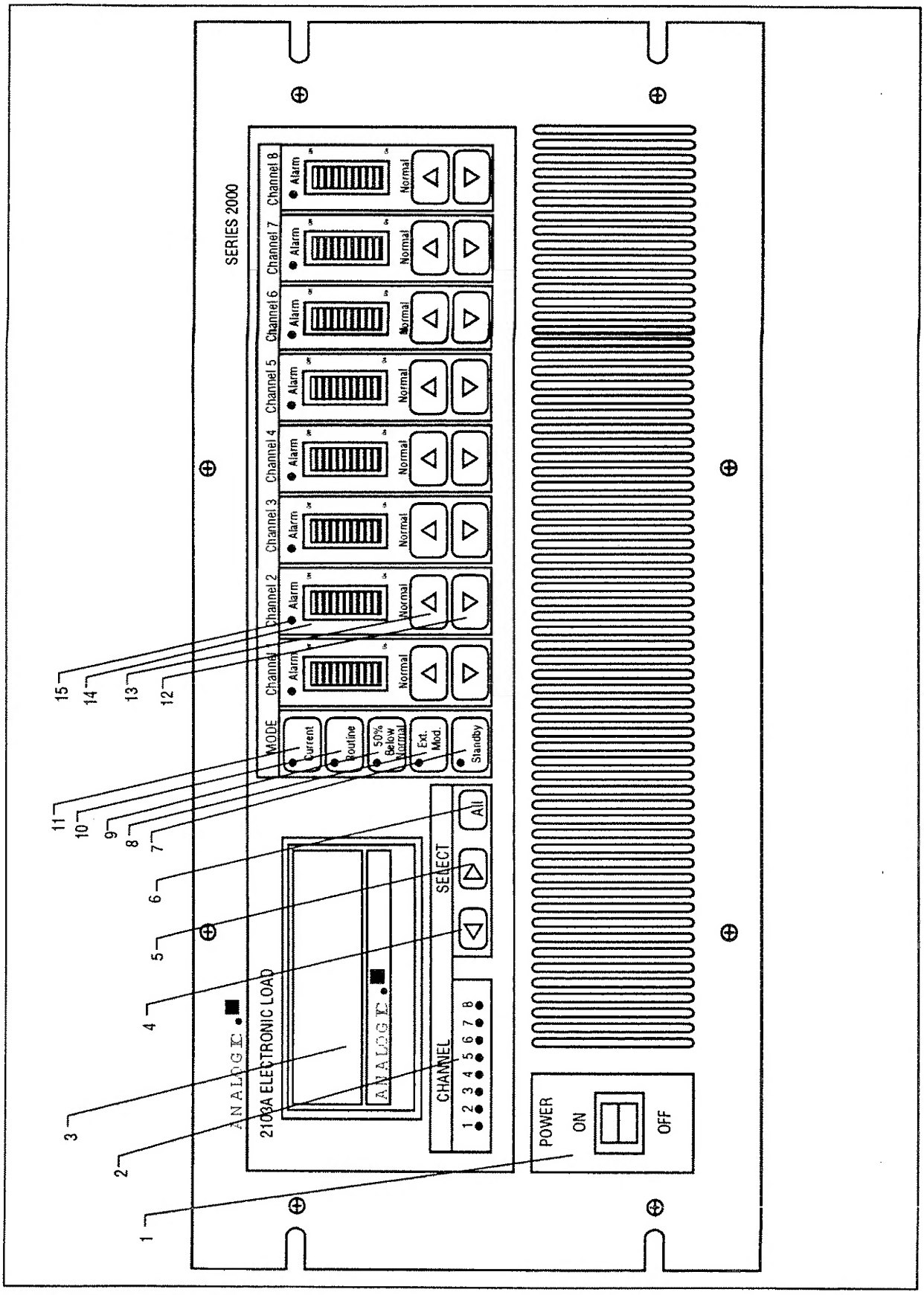


Figure 1-2. Front Panel Keyboard.

Electronic Load Key Definition Guide

The following is a list of each of the keys and their functions that appear on the front panel of the Model 2103A Electronic Load system. In parentheses please note the key number as it is referenced in Figure 1-2.

Select Keys

Key	Function
Left arrow (4)	This key is used to select different channels. Note that by pressing this key the channel number as indicated by the LEDs changes in descending order.
Right arrow (5)	By pressing this key, the selected channel (indicated by one of the eight LEDs in the channel group) will be moved to the right.
All (6)	This key has a number of different functions. Pressing this key followed by any key from the MODE key group results in executing the respective command for all channels as follows: [ALL] [CURRENT] – all the channels will go into current mode. [ALL] [RESISTIVE] – all the channels will go into resistive mode. [ALL] [50% BELOW NOMINAL] – all the channels which are in current mode will go 50% below nominal; the channels in resistive or external modulation mode will not be affected. [ALL] [EXT. MODULATION] – all the channels will go into external modulation mode. [ALL] [STAND BY] – all the channels will go into stand-by except the channels in external modulation mode. If the electronic load is in remote mode (GPIB mode) pressing this key will put the system into local mode. Pressing this key followed by the "left arrow" key will indicate the voltage for the selected channel on the 4 1/2 digit display. When the display is in voltage mode the mode LED is blinking. Pressing this key followed by the "right arrow" key will indicate the current for the selected channel on the 4 1/2 digit display.

Mode Keys	
Key	**Function**
	Note: All MODE keys have a corresponding MODE LED that indicates the status of the mode. With the LED on, that mode is activated.
Stand By (7)	By pressing this key, the selected channel will go into stand-by mode. Continuously pressing this key switches the load between the nominal current setting and zero dynamically at a frequency of approximately 200 Hz.
Ext. Mod. (8)	Pressing this key enables the external modulation input.
50% Below (9)	If in CURRENT mode, pressing this key results in the value of current setting to change to 50% of its nominal value. Continuously pressing this key switches the load between the nominal current setting and 50% of this value dynamically at a frequency of approximately 200 Hz.
Resistive (10)	Pressing this key activates the RESISTIVE mode of operation.
Current (11)	Pressing this key activates the CURRENT mode of operation.

Channel Keys	
Key	**Function**
Down arrow (12)	Pressing this key, the value for current or resistance for the respective channel may be decremented.
Up arrow (13)	Pressing this key, the value of current or resistance for the respective channel may be incremented.

Channel LEDs (2)

There are eight LEDs numbered from 1 to 8 indicating which channel is selected. Selecting a particular channel activates the voltage or current measurement for that channel (using the 4 1/2 digit display); it also enables the user to change the mode of operation using the MODE keys.

Alarm LEDs (15)

Every channel has an alarm LED which will blink if an alarm condition occurs (over-power, over-voltage, over-current, over-temperature).

Bar Graphs LEDs (14)

There is a 10 LED bar graph indicator for every channel indicating the setting point for a respective channel.

Chapter 2
Product Specifications

The following are the specifications for the multi-channel electronic load:

Dimensions and Weight:

Height:	8.72 in.
Width:	19.00 in.
Depth:	20.60 in.
Weight:	38 lbs.

Operating Conditions for any Single Channel

Operating Voltage:	4.0V (at 50A*) to 150 VDC *derated current can be obtained at lower operating voltages. (See Figure 2-1)
Maximum Operating Current:	50A
Maximum Operating Power:	250 watts (See Figure 2-2)

Current Mode

Range:	0.5 – 50.0 amps*
Resolution:	10.0 mA
Accuracy:	0.2% F.S., ±75 mA *usable range – range minimum is 0.0 amps ±100 mA

Resistive Mode

Resistive mode has four ranges depending on the output voltage of the unit under test.

Note: For good accuracy in Resistive Mode, the value of resistance in ohms should be smaller than the value of voltage in volts.

Range 1

UUT Output Voltage:	4.0 – 14.0V
Resistance (ohms):	0.096 – 4.8
Resolution (ohms):	0.096
Accuracy:	±1.5% of setting, ±0.096 ohms

Range 2

UUT Output Voltage:	4.0 – 50.0V
Resistance (ohms):	0.33 – 15
Resolution (ohms):	0.33
Accuracy:	±1.5% of setting, ±0.33 ohms

Range 3

UUT Output Voltage:	10.0 – 125V
Resistance (ohms):	0.75 – 30
Resolution (ohms):	0.75
Accuracy:	±5% of setting, ±0.75 ohms

Range 4

UUT Output Voltage:	10.0 – 150V
Resistance (ohms):	1 – 40
Resolution (ohms):	1
Accuracy:	±5% of setting, ±1.0 ohms

Current Measurement

Resolution:	4 1/2 digits
Accuracy:	±1% of setting, ±10 mA
Linearity:	±1 display count
Temperature drift:	80 ppm/°C
Self Calibration:	Offset and gain calibration once per second
Update rate:	50 ms

*Voltage Measurement**

Resolution:	4 1/2 digits
Accuracy:	±1% of setting, ±10 mV
Linearity:	±1 display count
Temperature drift:	80 ppm/°C
Self Calibration:	Offset and gain calibration once per second
Update rate:	50 ms

* with remote sense lines connected (see Figure 1-2, rear panel)

External Modulation Interface

Description

The external modulation feature of the Model 2103A Electronic Load enables the user to input waveforms or DC control voltages to control the load current. When the external modulation is used, the load acts as a transconductance (voltage to current) amplifier. The load inputs remain floating and isolated even if more than one load section is connected to the same external input.

Specifications

Number of External Inputs:	8
Current Ranges:	0 to 50 amps
Input Voltage for Full Scale Output:	5.0 volts
Bandwidth:	–3 dB at 45 kHz

Operation

Connecting the Signal Source

The external signal source is interfaced to the Model 2103A Load on the rear panel. There are 8 BNC connectors, labeled 1 to 8, one for each channel of the load. Use a standard BNC cable to connect the load channel to the external signal source.

Programming the Model 2103A Load

To use the external modulation of a given load channel, select the channel using the left arrow key, the right arrow key, or the ALL key and press "EXTERNAL MODULATION" in the "MODE" field. The "EXTERNAL MODULATION" LED will turn on indicating that the channel is in external modulation mode. The voltage input is linearly proportional to the loaded current.

Analog Meas. Out

Description

The BNC connector on the rear panel of the unit is provided so that it supplies the user with means of observing the waveforms for voltage and current in real time. The interface is a standard BNC connector.

Specification

Current:	
Range:	0 – 50.0 amps 50.0 amps = 1.875 volts ±1%, ±0.5 mV
Voltage:	
Range:	0 – 150 volts 150 volts = 5.18 volts ±1%, ±1 mV
Bandwidth:	–3 dB at 50 kHz
Probe:	A high impedance probe should be used

Operation

The current or voltage waveforms for a particular channel may be displayed using the ANALOG MEAS OUT connector on the rear panel. This may be activated by selecting the measurement function from the front panel or via the GPIB interface.

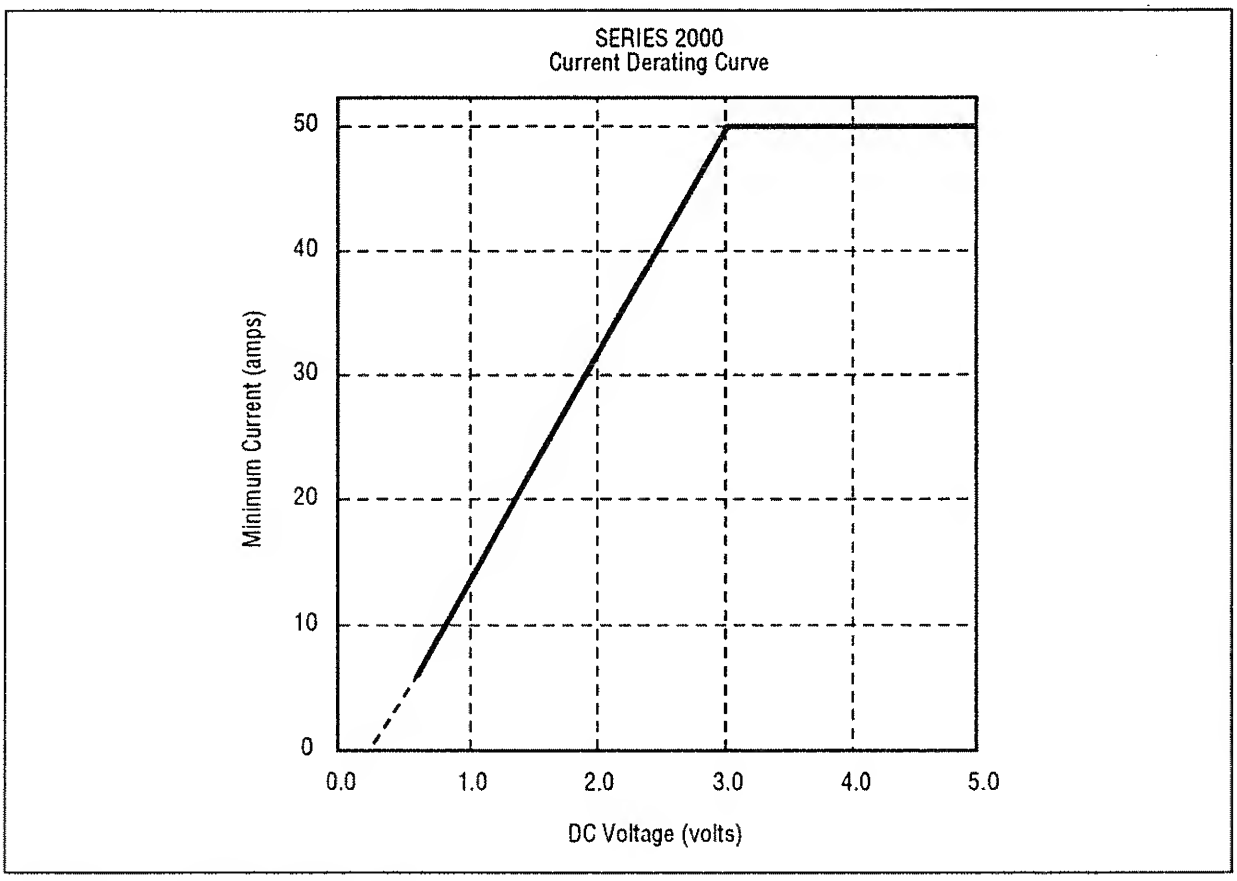


Figure 2-1. Current Derating Curve.

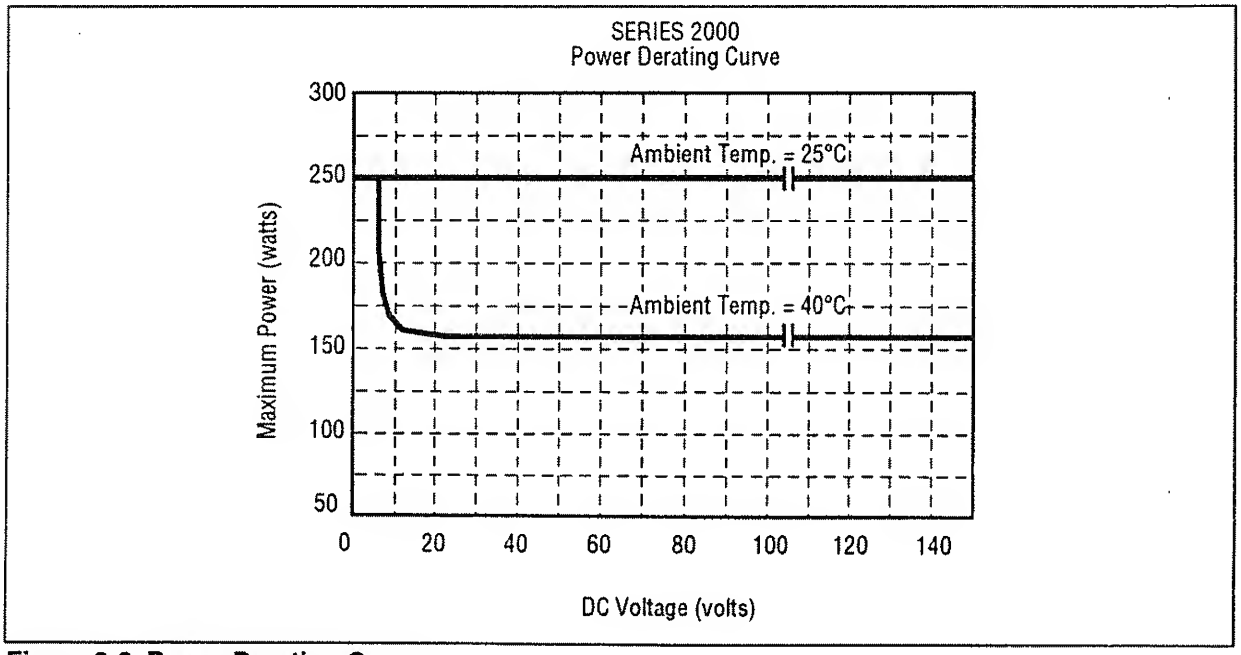


Figure 2-2. Power Derating Curve.

Chapter 3
Installation

Figure 3-1 shows the rear panel of the Model 2103A Electronic Load. The following is a detailed explanation of the different items on the rear panel and what their functions are, as related to installation:

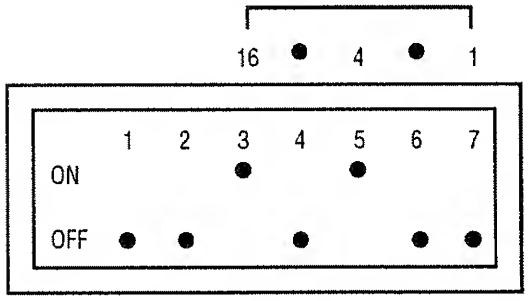
IEEE-488 (1) (optional)

Through this connector (also referred to as GPIB) the Model 2103A Electronic Load may be controlled via a computer if this option is installed. See Chapter 4, *Remote Operation* for more detail.

IEEE-488 Address Switch Setting (2) (optional)

The Model 2103A Electronic Load system can be programmable via the IEEE-488 bus. In order to set the IEEE-488 address, a dip switch located on the rear panel is used. IEEE-488 addresses range from 1 to 30. They are set using binary format where UP or (1) is TRUE and DOWN or (0) is FALSE. The factory default setting is 20. See Figure below. In order to change the IEEE-488 address, turn off the Model 2103A Electronic Load system, set the switch settings for the new address, and then turn the power on. This will reinitialize the load to the new IEEE-488 address.

Factory Default Setting (16 + 4 = 20)



External Modulation (4)

(See the description under the "Specification" section.)

Analog Meas. Out (5)

(See the description under the "Specification" section.)

Load Interface (6) and Remote Sense (7)

The following is a list of the pin-out connectors for the load interface connector. See Figure 3-2 for physical locations. For load pins (i.e., pins A1 through H2) 10 gauge cable is recommended.

2 Pin Load Connector		17 Pin Sense Connector	
Pin	Function	Pin	Function
A1	Load #1 (+)	1	Load #1 (+) Voltage Sense
A2	Load #1 (–)	2	Load #1 (–) Voltage Sense
B1	Load #2 (+)	3	Load #2 (+) Voltage Sense
B2	Load #2 (–)	4	Load #2 (–) Voltage Sense
C1	Load #3 (+)	5	Load #3 (+) Voltage Sense
C2	Load #3 (–)	6	Load #3 (–) Voltage Sense
D1	Load #4 (+)	7	Load #4 (+) Voltage Sense
D2	Load #4 (–)	8	Load #4 (–) Voltage Sense
E1	Load #5 (+)	9	Load #5 (+) Voltage Sense
E2	Load #5 (–)	10	Load #5 (–) Voltage Sense
F1	Load #6 (+)	12	Load #6 (+) Voltage Sense
F2	Load #6 (–)	13	Load #6 (–) Voltage Sense
G1	Load #7 (+)	14	Load #7 (+) Voltage Sense
G2	Load #7 (–)	15	Load #7 (–) Voltage Sense
H1	Load #8 (+)	16	Load #8 (+) Voltage Sense
H2	Load #8 (–)	17	Load #8 (–) Voltage Sense

Note: Pin 11 is not used.

Input Power Connector (8)

At least 300 VA of power is required. The Model 2103A Electronic Load may be configured for 120 or 240 volt operation by simply switching the module referred to by (9) in Figure 3-1.

Input Voltage Select Module (9)

As specified above, this module is used to switch from 120 volt input power mode to 240 volt.

Input Power Fuse (10)

A 5.0 amp fuse is recommended.

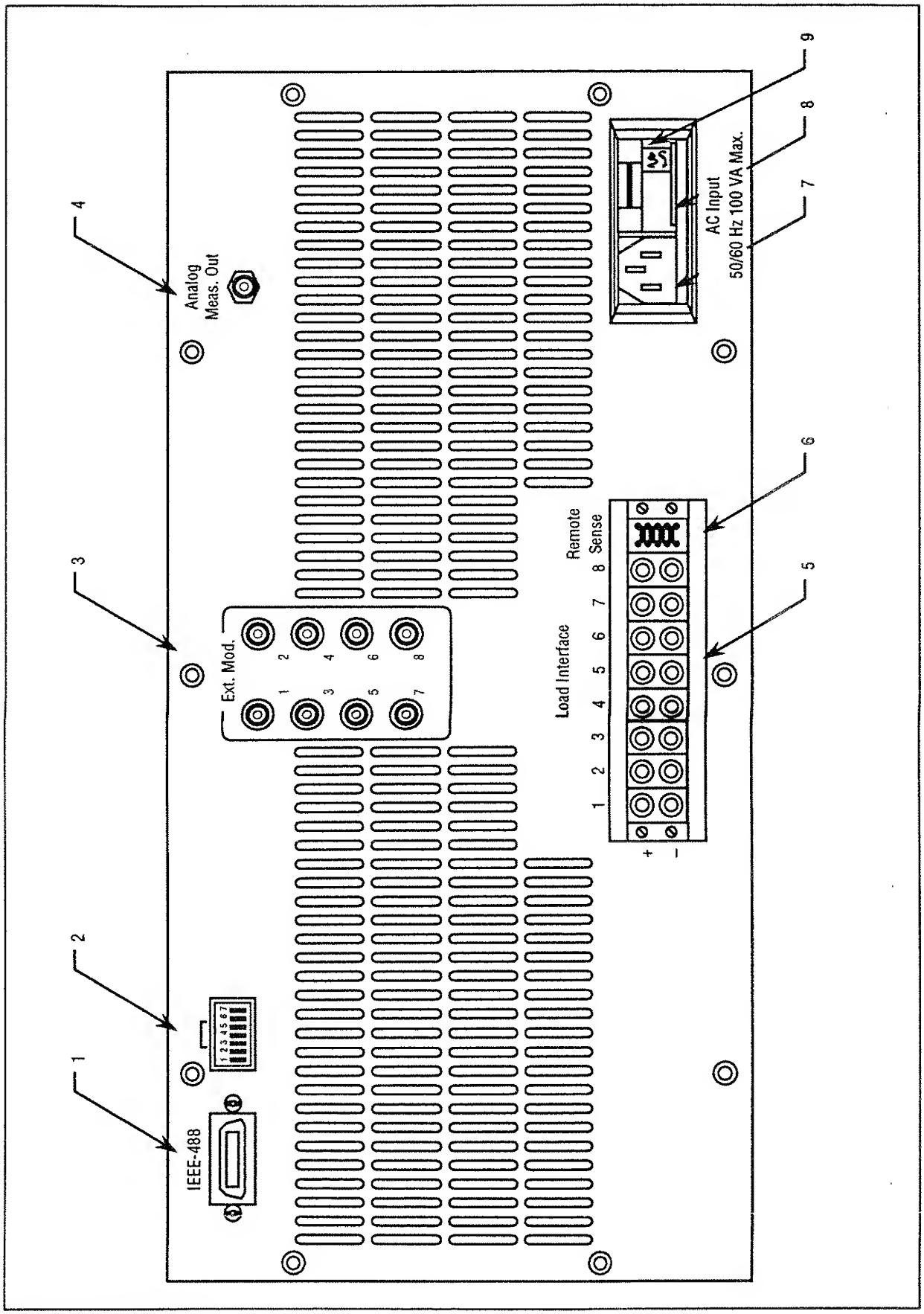


Figure 3-1. Rear Panel

Chapter 4
Operating Instructions

The Model 2103A Electronic Load accepts instructions locally, from the front panel, or remotely, over the optional IEEE-488 bus, to control and take measurements for each of the 8 load sections in the unit.

Powering the Unit On and Off

IMPORTANT: Insure that no external voltages are applied to the Model 2103A load terminals when powering the unit on or off. Turning the Model 2103A on or off with external voltages applied to the load channels can cause permanent damage to the instrument.

Local (Front Panel) vs. Remote (GPIB) Operation

Note: Square brackets [ ] indicate a command key on the front panel.

After power up the Electronic Load is in local mode with the front panel enabled. At power up the default mode of operation is the "Current Mode." All channels come up in the "Standby" condition. Notice the LEDs for the "Current Mode" and "Standby" are on. With the GPIB option installed, sending a command over the GPIB bus results in the unit to be operating in the REMOTE mode. All CHANNEL LEDs will be turned on indicating that the unit is in REMOTE mode. The Electronic Load can be switched back into 'LOCAL" mode by pressing the [ALL] key.

Selecting the Mode of Operation

Any load channel may operate in Constant Current or Constant Resistance mode. It may also be in the 'standby' mode in which case it will be inactive. In addition the programmed current value may be set to 50% of its nominal value by pressing the '50% below nominal' key. Operating mode for a load channel can be selected in the following manner:

Select the desired load channel using the [left arrow], or [right arrow] keys in the 'SELECT' field. The corresponding LED in the 'CHANNEL' field will be lit. The LEDs in the 'MODE' field indicate the channel status (i.e., if the channel is in 'resistive' mode, then the 'resistive' LED will be lit or if the channel is in 'current' and '50% below nominal' mode then the corresponding LEDs will be lit.) Note that th 4 1/2 digit display indicates the measured current or voltage value for the selected channel.

Change the operating mode for the channel by pressing the desired key in 'mode' field. The LEDs will indicate the new operating mode.

If it is desired to put all channels in a specific operating mode (for example all channels in 'standby' mode), the [ALL] key may be used in the following manner:

Press the [ALL] key. All 'channel' LEDs will be lit.

Press the desired mode key (for example 'CURRENT'). All channels will be in selected mode.

Setting Current or Resistance Value

The value for current or resistance may be set for every channel using the [up arrow] or [down arrow] keys.

Setting the Value of Current in CURRENT Mode:

Pressing [UP] ([DOWN]) key will increment (decrement) the current value for the respective channel with 10 mA of resolution. Setpoint for every channel is indicated by a bar-graph indicator with a resolution of 5 amps. During incrementing (decrementing) the current value, the LED for corresponding channel blinks.

Programming in Constant Resistance Mode:

To program the 2103 load in the resistance mode, the sense lines for each load channel used have to be connected to the output of the UUT (Unit Under Test) being tested. This also applies for when two or more channels are paralleled together.

To program a channel, press the down arrow key for that channel to increase the current drawn by the output of the UUT being tested and press the up arrow key to decrease the current draw by that output.

The panel display and the bar graph will always show the actual current being drawn by the output of the UUT being tested but not the resistance.

As specified in Chapter Two (Specifications), there are four operating ranges in the Resistive Mode depending on the UUT voltage. When in the Local Mode, the reanges are automatically selected as a function of UUT voltage. For example, if UUT voltage is set at 5 volts, Range 1 will be selected and the value of the resistor may be incremented/decremented with the Up/Down keys in 0.096Ω increments. This resistor value will be maintained over the specified voltage range (i.e., 4–14 volts0. If the voltage were to go beyond 14 volts, the range will automatically switch to Range 2 and the resistance value will be set for the new range according to the following formula:

$$\text{New resistance} = \text{New range step} * \frac{\text{old resistance}}{\text{old range step}}$$

For example, if in Range 1 the resistance was at 0.288Ω, and the voltage was increased from 6 volts to 20 volts, the new resistor value will be:

$$0.33 * \frac{0.288}{0.096} = 0.99 \text{ ohm}$$

In the GPIB remote operation, the resistive ranges are established with the RRANGE Command (See GPIB Commands) and are not changed as a result of voltage change. The user, therefore, should change the range if the UUT voltage is expected to fall out of range.

Current Measurement

Current measurement may be activated by pressing the [ALL] key followed by the [right arrow] key. The instrument will display the current for the selected channel.

Voltage Measurement

Voltage measurement may be activated by pressing the [ALL] key followed by the [left arrow] key. The instrument will display the voltage for the selected channel. The LEDs on the 'current' or 'resistive' mode keys (depending on which one is selected) will blink indicating that the voltage measurement (and not current measurement) is displayed.

When changing from voltage to current measurement or vice versa, allow a few seconds for the new measurement value to stabilize.

Measurements of the same type are now faster than measurements of opposite type. For example, if you need to measure voltage and current for all 8 channels, it's faster to read all the voltages first and then read all the currents, rather than alternating voltage and current. It takes longer to alternate because there is a delay involved when switching from voltage to current mode within the panel meter on the front of the 2103.

Alarm Conditions

Over-voltage, over-current, over-power, or over-temperature conditions result in the ALARM LED being on. The LED will remain on even if the alarm condition is removed; the particular alarmed channel will go into the "Standby" mode. Pressing any command key or sending an alarm command via GPIB will turn the LED off.

When an alarm occurs RNOMINAL and RRANGE now go to their default values, RNOMINAL = 50 ohms and RRANGE = 4.

External Modulation

The external modulation inputs may be activated by pressing the [EXT.MOD.] key. The corresponding LED will turn on indicating that the channel is in external modulation. The user shall provide external modulation signal (from a signal generator — see chapter 2 for electrical specifications) via corresponding BNC connector on rear panel. Note that the same signal generator may be used for more than one channel; channel-to-channel isolation is provided internally. The [STANDBY] key will not turn the external modulation mode off. The [EXTERNAL MODULATION] key has to be pressed again to turn the external modulation mode OFF. Note: the external modulation mode will not work in the Remote (GPIB) Program Mode.

Dynamic Mode — Front Panel Access

Manual operation of the front panel keyboard allows the user to dynamically switch 50% of nominal current or 100% of nominal current at a fixed frequency of 200 Hz (factory selectable from 10 to 200 Hz by continually pressing the "50% below nominal" or "Standby" keys). Slew rate is 5.0 amps/μs typical.

Dynamic Mode — GPIB Interface

Each channel can be programmed with two current values from .5 to 50 amps. The channel can be programmed with a switching frequency ranging between 10 Hz to 200 Hz. Slew rate is 5.0 amps/μs typical.

Remote (GPIB) Operation

Remote operation of the Model 2103A Electronic Load system requires a computer keyboard to input instructions or commands to the IEEE-488 bus. The bus will then transfer this information to be carried out by the electronic load unit.

By sending any of the following GPIB commands, the Electronic Load will automatically go into the REMOTE mode. All CHANNEL LEDs will be turned on indicating that the unit is in REMOTE mode.

The GPIB address setting switch is located on the rear panel (see *Installation*, Chapter Three).

The following are the IEEE commands for the Model 2103A Electronic Load unit:

Parameter Commands

Command	Function
RRANGE n	This command changes the resistive range of the selected load or group and is dependent on the voltage at the output of the power supply. N is a range number between 1 and 4.

Range	Volts
1	4 – 14V
2	4 – 50V
3	10 – 125V
4	10 – 150V

IOFFSET n	Multiply the nominal current of the selected load(s) by n% (where 0 <= n <= 99).
RNOMINAL n	Set the nominal resistance to n ohms. Data format: x.xxxxE+xx
INOMINAL n	Set the nominal current to n amps. Data format: x.xxxxE+xx
HIGH	This command enables the static high level mode of the selected load or group.
LOW	This command enables the static low level mode of the selected load or group.

Measurement Commands

Command	Functions
MV nnn	Measure voltage of nnn load(s). nnn = single load, e.x. 1 multiple loads separated by commas, e.x. 1,3,7 range of loads with endpoints separated by .., e.x. 3 . . 7 combinations of the above Data is returned in the format: x.xxxxE+xx,x.xxxxE+xx, etc.
MI nnn	Measure the current of nnn load(s) nnn = single load, e.x. 1 multiple loads separated by commas, e.x. 1,3,7 range of loads with endpoints separated by .., e.x. 3 . . 7 combinations of the above Data is returned in the format: x.xxxxE+xx,x.xxxxE+xx, etc.\
FASTV nnn	Provides a very quick rough approximation to the actual voltage. The measurement uses an 8-bit A/D converter, and its accuracy is not specified. nnn is the same as for "MV" and "MI."

Note: 1. If the "MV", "MI" or "FASTV" command is entered without a load list, the measurements are performed on the currently selected loads.

Mode Commands

Command	Function
IMODE	Set selected load(s) to current mode
RMODE	Set selected load(s) to resistive mode
LOAD nnn	This command selects an individual load or group for programming or measuring. NNN is the load or group. Note: For a range of loads enter two dots (. .) between two numbers to indicate a continuous group and/or a comma (,) to separate two arbitrary loads or continuous group. Example: LOAD 3 . . 7 (continuous group) LOAD 1,3,7 (arbitrary group) LOAD 1,3 . . 5,7 (combination group)
DYNAMIC	Set selected load(s) to dynamic current mode, oscillating between INOMINAL and IOFFSET amps at FREQ Hz.
COPY n,nnn	This command copies the parameters of one load to another. N is the source load and NNN is the destination load.
LOCAL	This command switches from remote mode to local mode.
STATIC	Set selected load(s) to static current mode at INOMINAL amps.
FREQ n	Set oscillation frequency to n Hz for load(s) in dynamic current mode (where $10 \leq n \leq 200$).

Status Commands

Command	Function
EXEC	Run the selected load(s) with programmed params. All other commands require an EXEC to take effect.
CLEAR nnn	Sets the selected channels to their default (power-on) settings.
CLEARALL	Sets all channels to their default (power-on) settings.
STOP	Set the selected load(s) to standby mode.
STOPALL	Set all load(s) to standby mode.

Miscellaneous Commands

Command	Function
STATUS n	Send parameters from selected load(s) to controller. Format of return string: <LOAD=x: INOMINAL=x, IOFFSET=x, RRANGE=x, RNOMINAL=x, IMODE/RMODE,RUN/STOP/EXTMOD/ALARM;>
ALARM	This command lists the alarmed loads. Format for return list of loads which have alarms: ALARM = x,x,x,... where x is the actual load. Format for return list of loads which have no alarms: ALARM = none
VERSION	Send version number to controller Format of return string: ML Vx.xx mm-dd-yy
	Note: Due to the fact that the GPIB commands are executed with different speed (e.g., the "EXEC" command is executed very fast, and the current or voltage measurement commands are slow), it is recommended that the user checks the serial poll byte for the "BUSY" bit and the "DATA AVAILABLE" bit. The contents of the serial poll byte is the following:
	bit 0 – not used
	bit 1 – busy (command in progress)
	bit 2 – rda (requested data available)
	bit 3 – run/stop (0 – stop, 1 – run)
	bit 4 – device alarm (alarm condition present)
	bit 5 – measurement error *
	bit 6 – service request
	bit 7 – command error (error in command string)
	* Serial poll bit 5 is set to 1 if there is an error in serial communications between the 2103 and the panel meter. This bit should be checked after sending either the "MV" or "MI" commands.

Chapter 5
Calibration

Scope

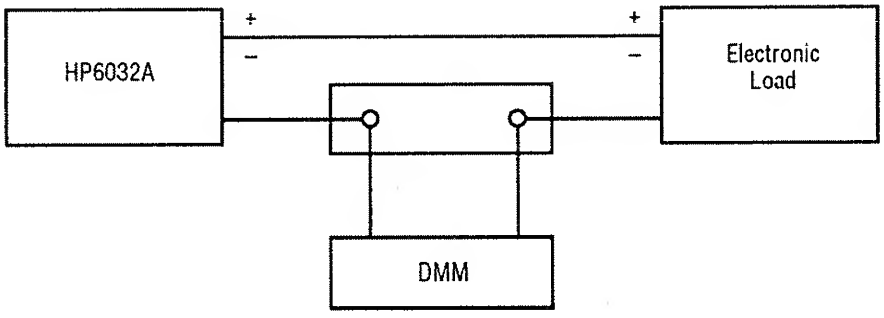
The Model 2103A Electronic Load was designed to minimize the calibration effort. The following consists of a brief procedure that should be performed on the controller board (PN 10-14206). The unit should be calibrated once every six months.

Equipment

1. Digital Multimeter (HP 3478A or equivalent)
2. DC Power Supply (HP 6032A or equivalent)
3. Current Shunt 100 mV = 50 amps, +0.05% accuracy

Procedure

1. Turn on the Model 2103A Electronic Load.
2. Connect the power supply (HP 6032A) to channel 1 of the ELECTRONIC LOAD (pins A1 and A2 of the power connector on the rear panel) through the shunt and the DMM as shown in the diagram below:



3. Set the voltage on the HP 6032A to 5 volts.
4. Set the current limit on the HP 6032A to 5 amps.
5. On the DMM press [DCV].
6. Program channel 1 in current mode to the maximum value of 50 amps by pressing [up arrow] key until maximum value is reached (i.e., the current measured with the external digital multimeter doesn't increase anymore).
7. Adjust the resistor pot R14 for a reading of 100 ±0.1 mV on the HP 3478 voltmeter.
8. Program channel 1 to the minimum value 0 amps by pressing the [DOWN] key until minimum value is reached (i.e., the current measured with the external digital multimeter doesn't decrease anymore).
9. Adjust the resistor pot R134 for a reading of 0.000 ±0.1 mV on the HP 3478 voltmeter.

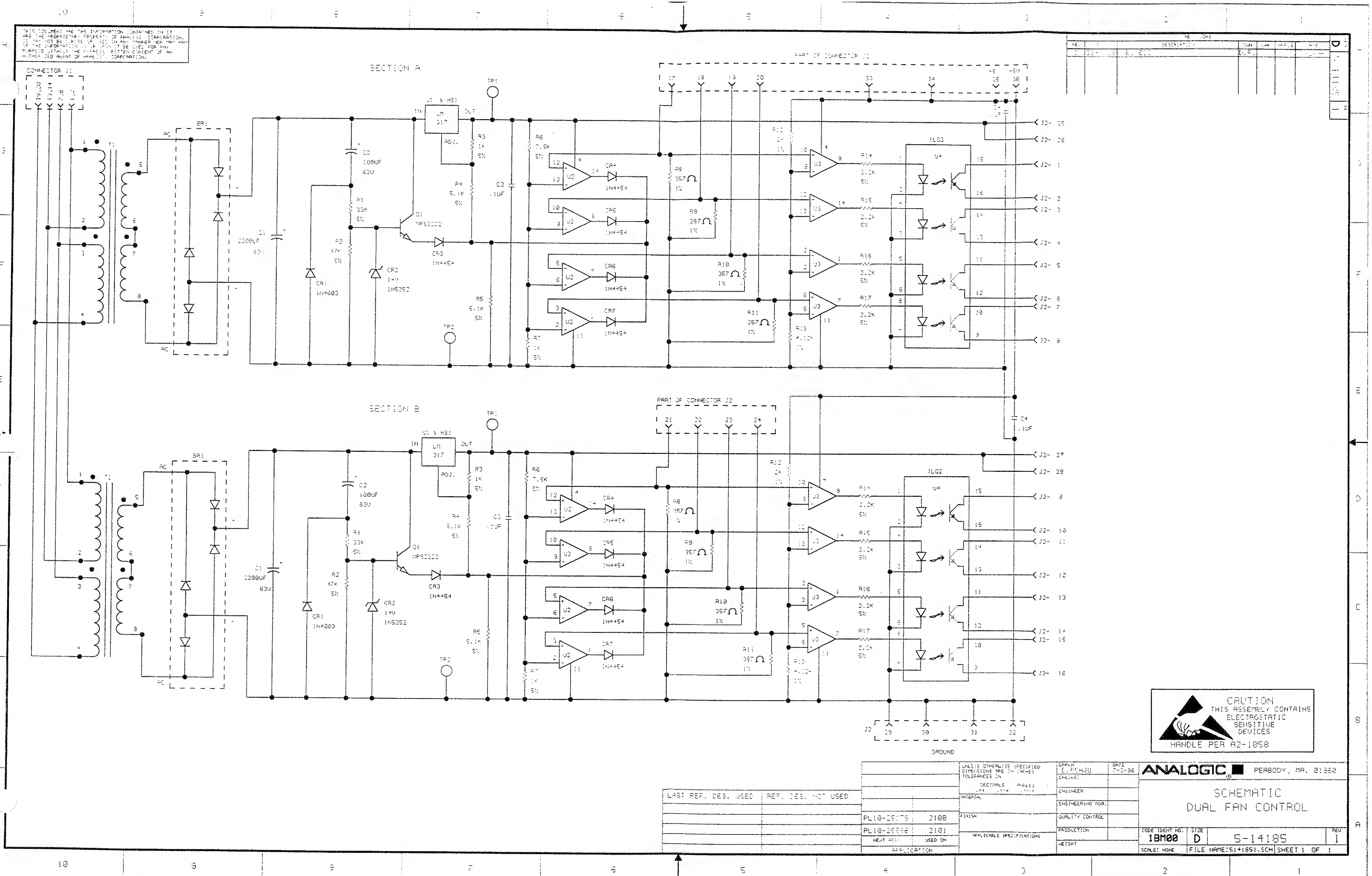
10. Connect the output of the power supply to channels 2 through 8 and repeat steps 6 through 9 by adjusting the following resistor pots for full-scale calibration:

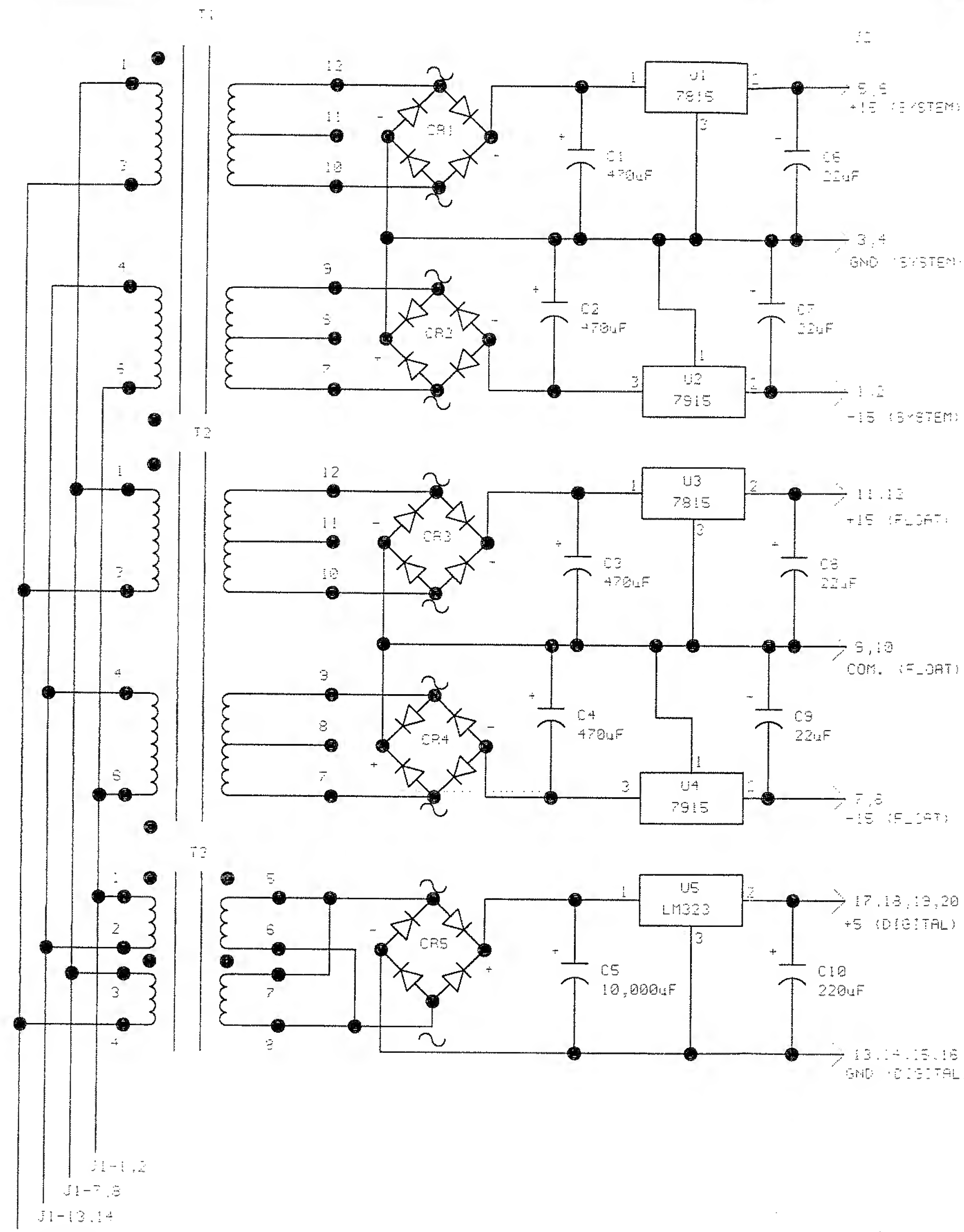
	CHANNEL 2 — R16
CHANNEL 3 — R46	CHANNEL 4 — R48
CHANNEL 5 — R78	CHANNEL 6 — R80
CHANNEL 7 — R110	CHANNEL 8 — R112

and the following for zero calibration:

	CHANNEL 2 — R140
CHANNEL 3 — R146	CHANNEL 4 — R152
CHANNEL 5 — R158	CHANNEL 6 — R164
CHANNEL 7 — R170	CHANNEL 8 — R176

Appendix **A**
Unit Schematics


SECTION A
SECTION B
PART OF CONNECTOR J2
CONNECTOR J1
GROUND
CAUTION
THIS ASSEMBLY CONTAINS
ELECTROSTATIC
SENSITIVE
DEVICES
HANDLE PER A2-1058
ANALOGIC
PEABODY, MA. 01960
SCHEMATIC
DUAL FAN CONTROL
CODE IDENT NO. 1BM00
SIZE D
5-14185
REV 1
SCALE: NONE
FILE NAME:5141851.SCH
SHEET 1 OF 1
LAST REF. DES. USED
REF. DES. NOT USED
PL10-25179 2108
PL10-25178 2101
NEXT ASSY
USED ON
APPLICATION
APPLICABLE SPECIFICATIONS
DRAWN
CHECKED
ENGINEER
ENGINEERING MGR.
QUALITY CONTROL
PRODUCTION
WEIGHT
MATERIAL
FINISH



LAST REF. DES. USED	REF. DES. NOT USED
C10,CR5,J2,T3,U5	

10-15187	2103
10-15386	2101
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .XX .XXX ANGLES

MATERIAL

FINISH

APPLICABLE SPECIFICATIONS

DRAWN D.POHJU	DATE 5/20/96	
CHECKED		
ENGINEER		
ENGINEERING MGR.		
QUALITY CONTROL		
PRODUCTION		
WEIGHT		

ANALOGIC® PEABODY, MA. 01960

SCHEMATIC POWER SUPPLY

CODE IDENT NO.	SIZE		REV
1BM00	D	5-14186	0C

SCALE: NONE SHEET 1 OF 1

REV	ECO	DESCRIPTION	CHK	DWN	APPLS	DATE
0C		SEE ECO		D.P		

D 5-14186 0C

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REVISIONS							
REV	ECO	DESCRIPTION	DWN	CHK	APPLS	DATE
0	11-8046	RELEASE	DRK	RR	PS	04-23-92
1	33-0206	SEE ECO	WF	MF	RL	11-22-95
2	33-0595	SEE ECO	D.P.	W.F.	RL	6-20-97
3	33-0729	SEE ECO	D.P.	W.F.	RL	2-17-98

SIZE D 9-2993 REV 3

- 2103A CUSTOMER_ORDER NUMBER
  - 2103A_SALES ORDER_NUMBER 10-28308
    - SHIPPING ASSEMBLY 10-25176-009
      - FINAL ASSEMBLY 10-25177-009
        - TEST ASSEMBLY 10-25178-009
          - CHASSIS ASSEMBLY 10-25179-005
            - CARD_CAGE ASSEMBLY 10-25187-001
              - MOTHERBOARD PCB_ASS'Y 10-14206-001
                - FIRMWARE 88=10230
              - SYSTEM_P.S. PCB_ASS'Y 10-14186-003
              - FAN_CONTROL PCB_ASS'Y 10-14185-003
            - FRONT_PANEL ASSEMBLY 10-25185
              - FRONT_PANEL METER_ASSY 10-25181
                - AN2400-001 METER_ASSY
                  - SEE FAMILY TREE #9-2840 (AN240X SERIES) REFERENCE
                - AN24A RS232/RELAY OPTION
              - KEYBOARD_CABLE ASSEMBLY 10-25186
            - LOAD_CUBE MECH_ASS'Y 10-24998-001
              - 150V_LOAD_CUBE PCB_ASS'Y 10-14160
            - FAN_HARNESS ASSEMBLY 10-25593-002
            - LOAD_CUBE CONTROL_CABLE 10-25591-001
            - 2103A_REAR PANEL_ASSBY 10-28311
              - AC_LINE HARNESS_ASS'Y 10-25590
              - LOAD_OUTPUT HARNESS_ASSY 10-25182-001
              - IEEE_HARNESS ASSEMBLY 10-25183
              - LOAD_ADDRESS BOARD_ASSY 10-28388-002
                - DIP_SWITCH CABLE_ASS'Y 10-25733
              - SRS2000_ANALOG CABLE_ASSY 10-25594
              - 2103A_EXT_MOD CABLE_ASS'Y 10-28318
              - 8CH_EXT_MOD PCB_ASS'Y 10-14194-003

LAST REF. DES. USED	REF. DES. NOT USED

PL10-25177 2103A
NEXT ASSY | USED ON
APPLICATION

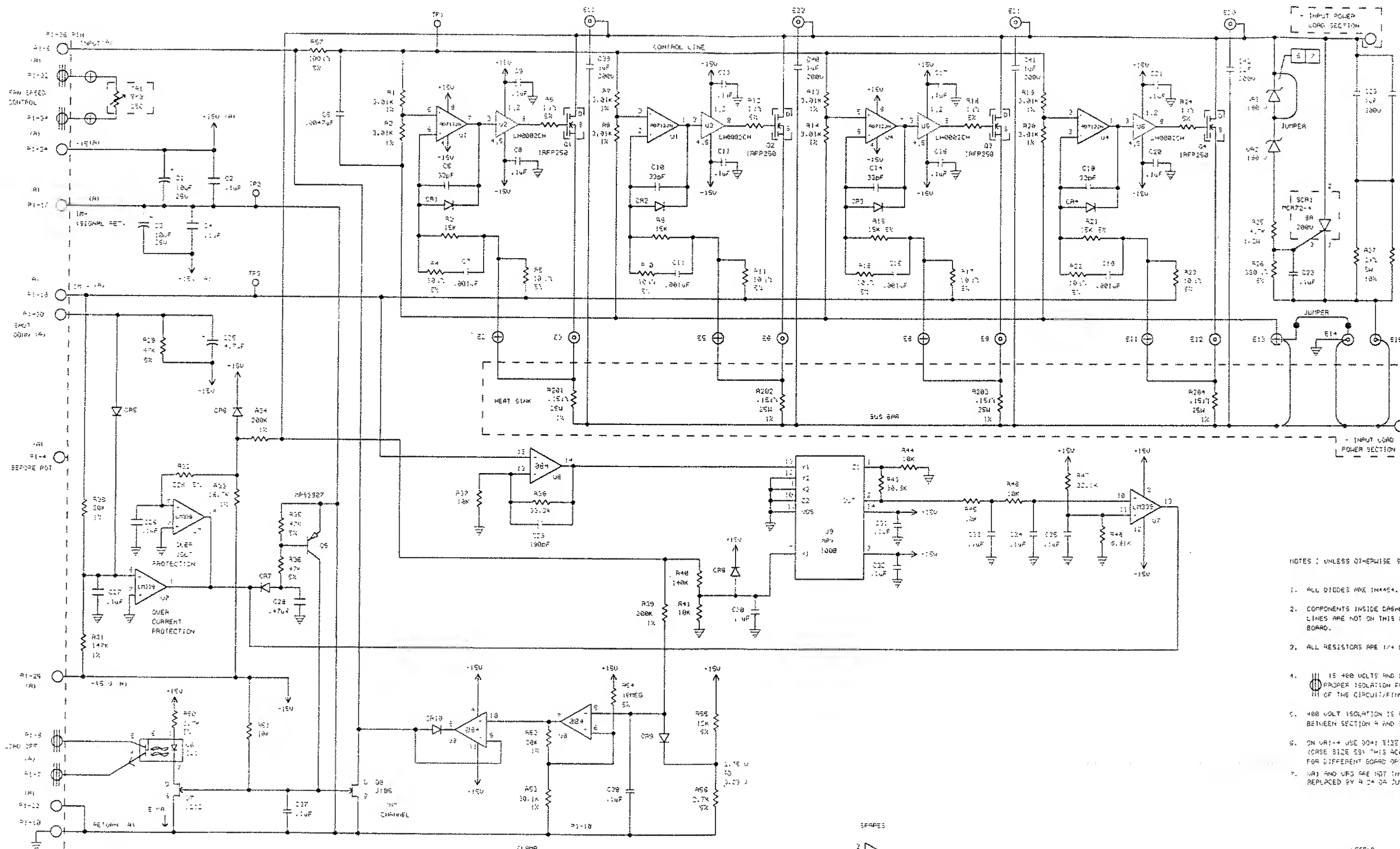
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS .X± .XX± .XXX± ANGLES
MATERIAL
FINISH
APPLICABLE SPECIFICATIONS

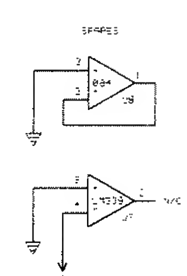
		DATE
DRAWN	DAN KEEFE	04-03-92
CHECKED	R.ROSS	04-10-92
ENGINEER	P.SHIPPEN	04-23-92
ENGINEERING MGR.	S.MARCOVICI	04-28-92
QUALITY CONTROL	G.RICHMOND	04-29-92
PRODUCTION	S.STREETER	04-24-92
WEIGHT		

ANALOGIC PEABODY, MA. 01960

2103A ELECTRONIC LOAD FAMILY TREE

CODE IDENT NO.	SIZE		REV
1BM00	D	9-2993	3
SCALE: NONE	FILENAME: 92993R3.SCH		SHEET 1 OF 1





NOTES : UNLESS OTHERWISE SPECIFIED:

1. ALL DIODES ARE 1N4454.
2. COMPONENTS INSIDE DASHED LINES ARE NOT ON THIS PC BOARD.
3. ALL RESISTORS ARE 1/4 WATT.
4. IS 400 VOLTS AND REQUIRES PROPER ISOLATION FROM THE REST OF THE CIRCUIT/PINS (AIR GAP).
5. 400 VOLT ISOLATION IS REQUIRED BETWEEN SECTION A AND SECTION B.
6. ON VR1-4 USE DO41 SIZE FOOT PRINT (CASE SIZE 59) THIS ACCOMMODATES FOR DIFFERENT BOARD OPTIONS.
7. VR1 AND VR3 ARE NOT INSTALLED, BUT ARE REPLACED BY A 24 GA JUMPER WIRE.

LEGEND

- #22 WIRE PAD/HOLE
- #16 WIRE PAD/HOLE

NOT USED

A49

C36

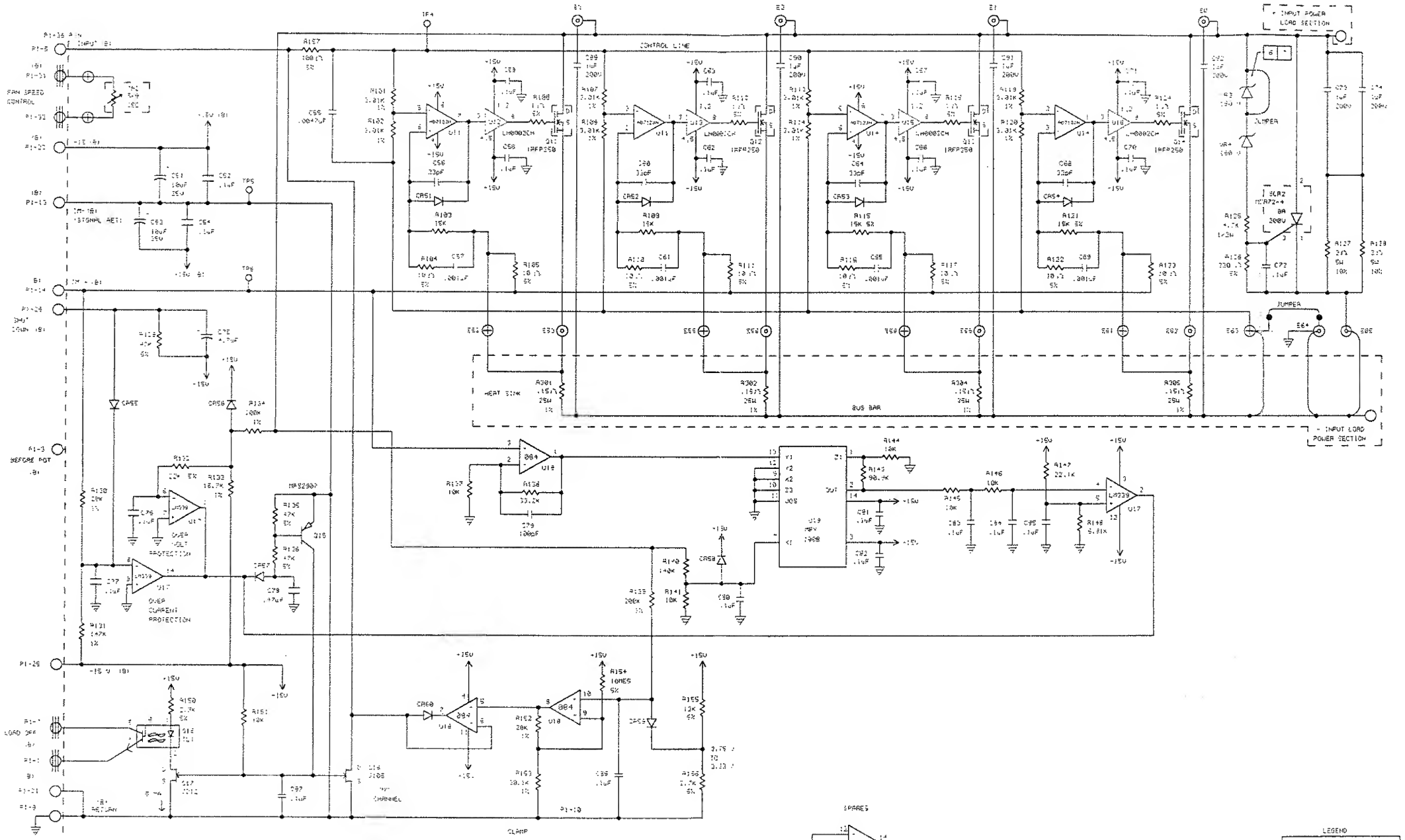
		DRAWN	D. PONJU	DATE 4/26/98
		CHECKED		
	ANC103A	ENGINEER		
PL10-44100	ANC101A	ENGINEERING MGR.		
NEXT ASSY	USED ON	QUALITY CONTROL		
APPLICATION		PRODUCTION		

ANALOGIC PEABODY, MA. 01960

SCHEMATIC
POWER LOAD CUBE
(SECTION A)

CODE IDENT NO.	SIZE	DWG. NO.	REV
16M00	E	901146	01

SCALE: - SHEET 1 OF 2



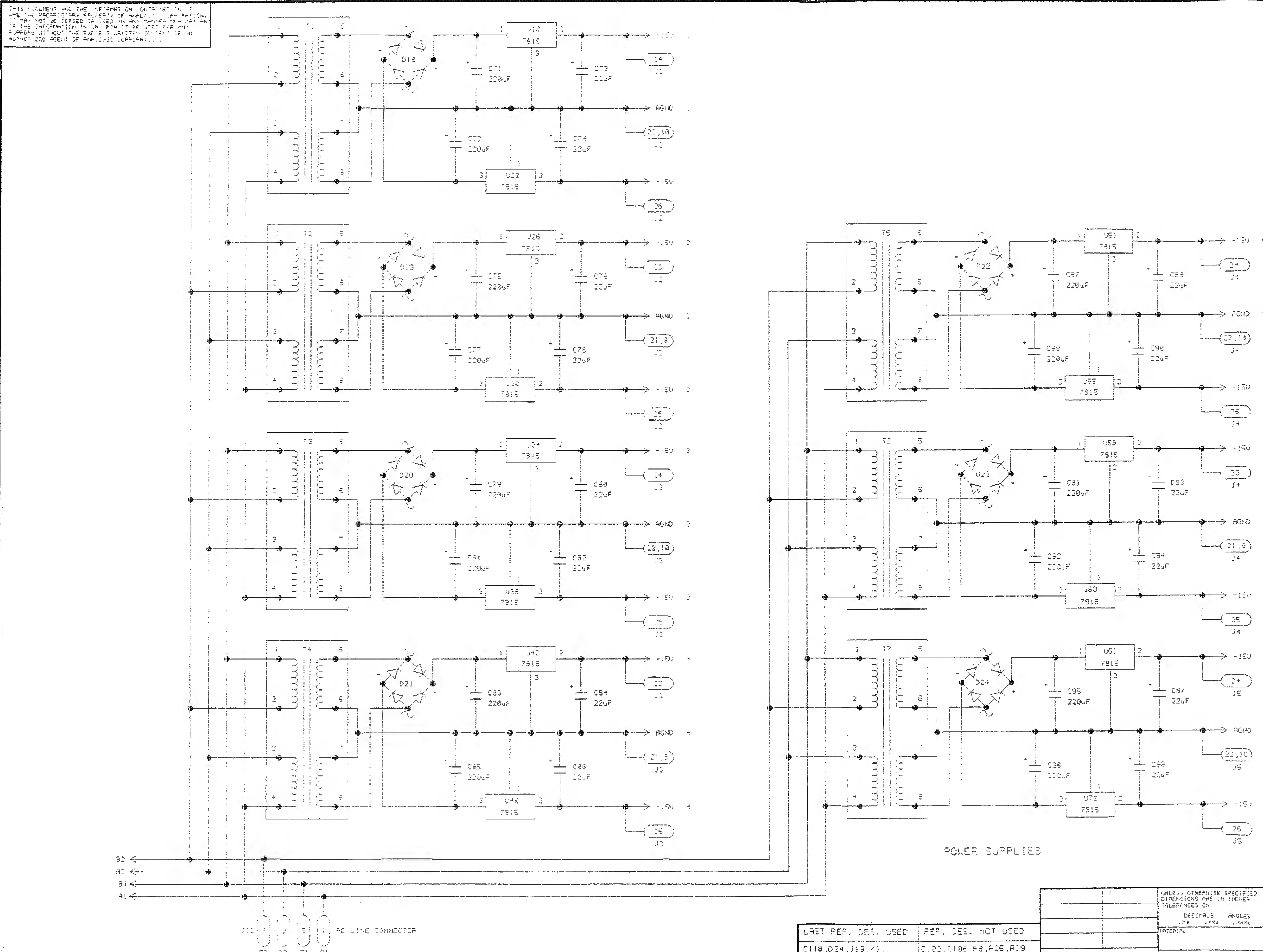
ANALOGIC, PEABODY, MA. 01960

SCHEMATIC
POWER LOAD CUBE
(SECTION B)

CODE IDENT NO.	SIZE	DWG. NO.	REV
18M00	E	901146	01

SCALE: NONE | SHEET 2 OF 2

8FEB92
ESM1268H.SCH



NOTES :

1. U13,U14 PIN 13 & U21,U37,U73,U74 PIN 4 ARE CONNECTED TO -15V.
   U17,U25 PIN 4 & U21,U37,U73,U74 PIN 11 ARE CONNECTED TO -15V.
   U33 & U41 PIN 5 ARE CONNECTED TO COMMON ANALOG GND.
2. = DIGITAL GROUND = COMMON ANALOG GROUND = ISOLATED ANALOG GROUND

   DIGITAL GROUND AND ANALOG GROUND ARE TIED TOGETHER.
3. D18-D24 ARE DF02M 5,1A,200V.

CAUTION
THIS ASSEMBLY CONTAINS ELECTROSTATIC SENSITIVE DEVICES
HANDLE PER 42-1058

LAST REF. DES. USED	REF. DES. NOT USED
C118,D24,J19,K3,	C.22,C108,F9,F25,F39
R185,RN2,T7,U75,W2	R10-R12,R57,R61-R64,
	R73,R89,F93-96,R105,
	R111,R125-R131

PL10-25197 | 2103A
NEXT ASSY | USED ON
APPLICATION

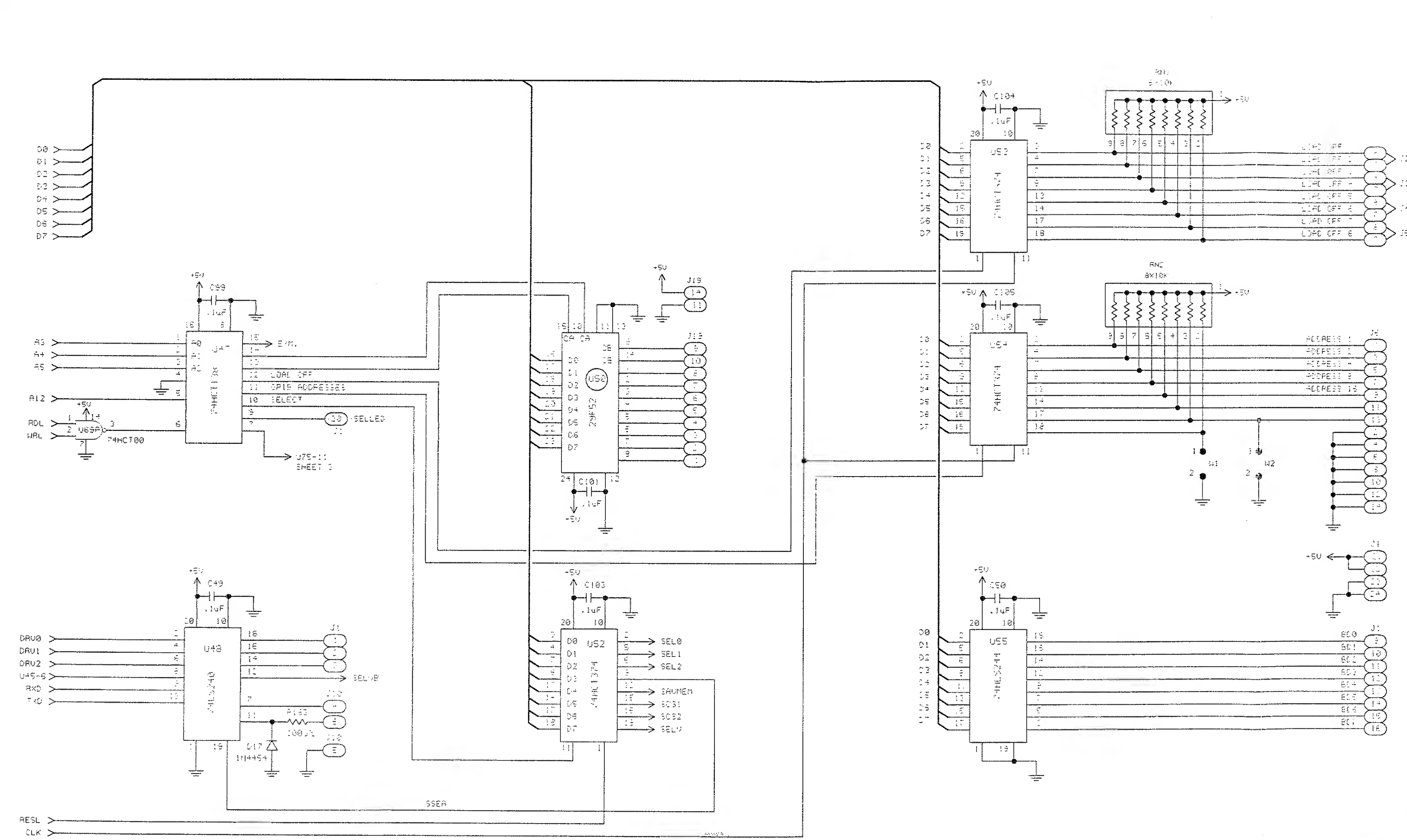
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .XX .XXX ANGLES .XXX
MATERIAL
FINISH
APPLICABLE SPECIFICATIONS

DRAWN	D. ECHJU	7/31/96
CHECKED	L.E. FOLEY	7/31/97
ENGINEER	F.A. LANE	7/31/97
ENGINEERING MGR.	M.F. AHEARN	7/31/97
QUALITY CONTROL	B. CHENARD	7/31/97
PRODUCTION	J. BELLIVEAU	7/31/97
WEIGHT		

ANALOGIC PEABODY, MA. 01960

SCHEMATIC
2103A MOTHERBOARD

CODE IDENT NO. 1BM00 | SIZE D | 5-14206 | REV 1
SCALE: NONE | FILE NAME:14206A1.SCH | SHEET 1 OF 8



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CAUTION
THIS ASSEMBLY CONTAINS ELECTROSTATIC SENSITIVE DEVICES
HANDLE PER A2-1058

LAST REF. DES. USED	REF. DES. NOT USED

ANALOGIC, PEABODY, MA. 01960

CODE IDENT NO.	SIZE		REV
18M00	D	5-14206	1
SCALE: NONE	FILE NAME: 1420652.SCH	SHEET 2 OF 8	

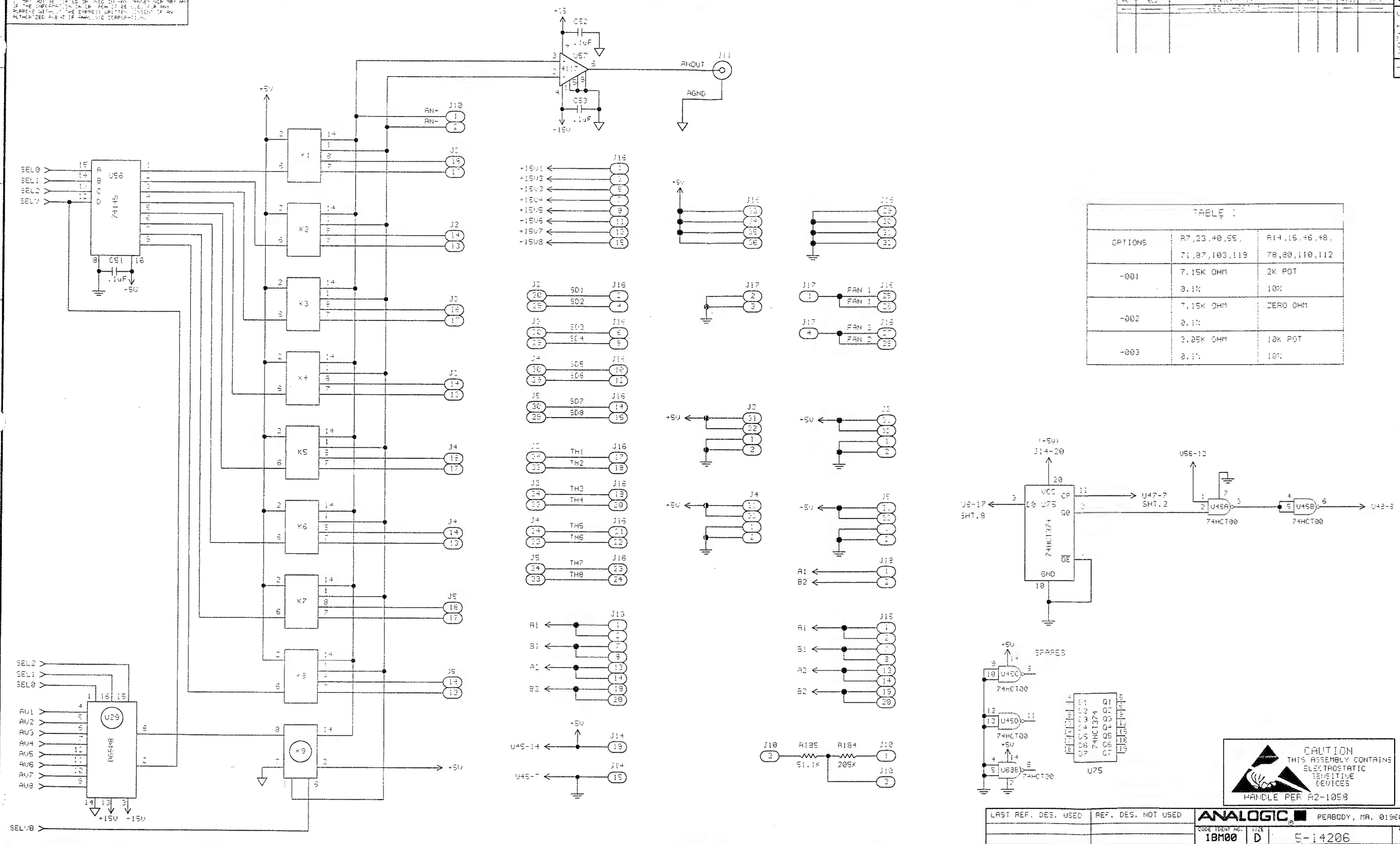
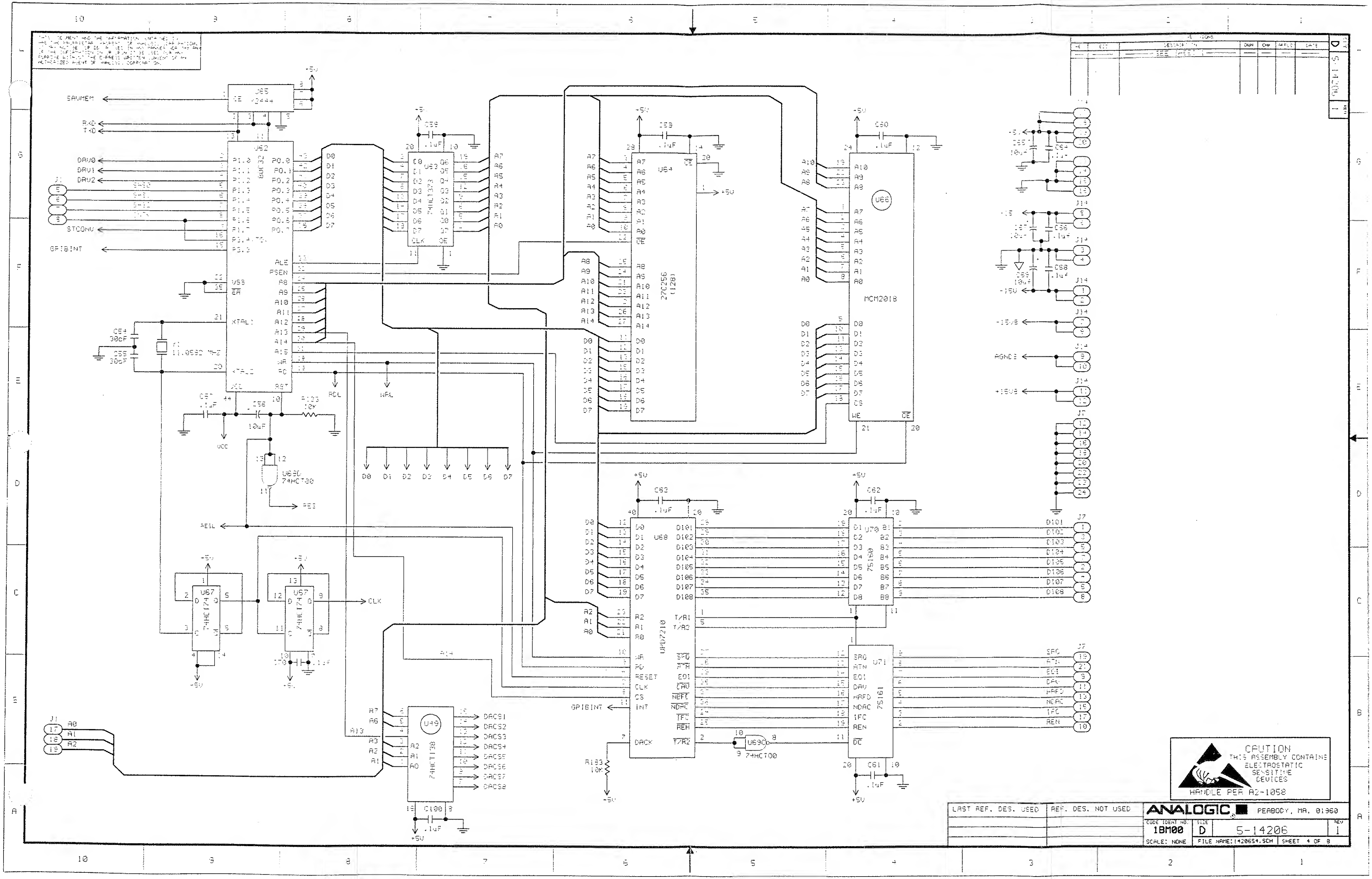


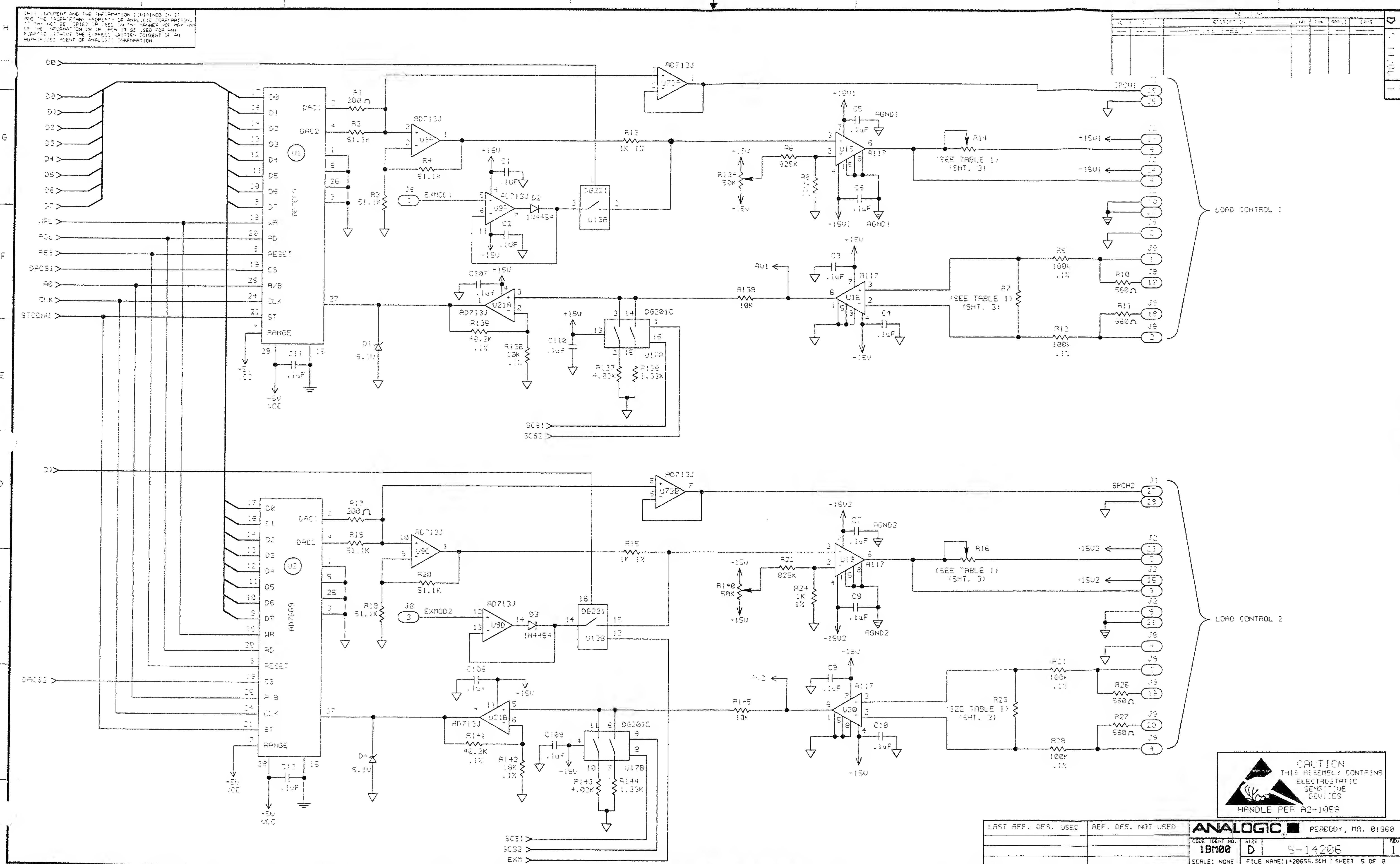
TABLE 1		
OPTIONS	R7,23,40,55, 71,87,103,119	R14,15,46,48, 78,80,110,112
-001	7.15K OHM 0.1%	2K POT 10%
-002	7.15K OHM 0.1%	ZERO OHM
-003	3.05K OHM 0.1%	10K POT 10%

CAUTION
THIS ASSEMBLY CONTAINS ELECTROSTATIC SENSITIVE DEVICES
HANDLE PER A2-1058

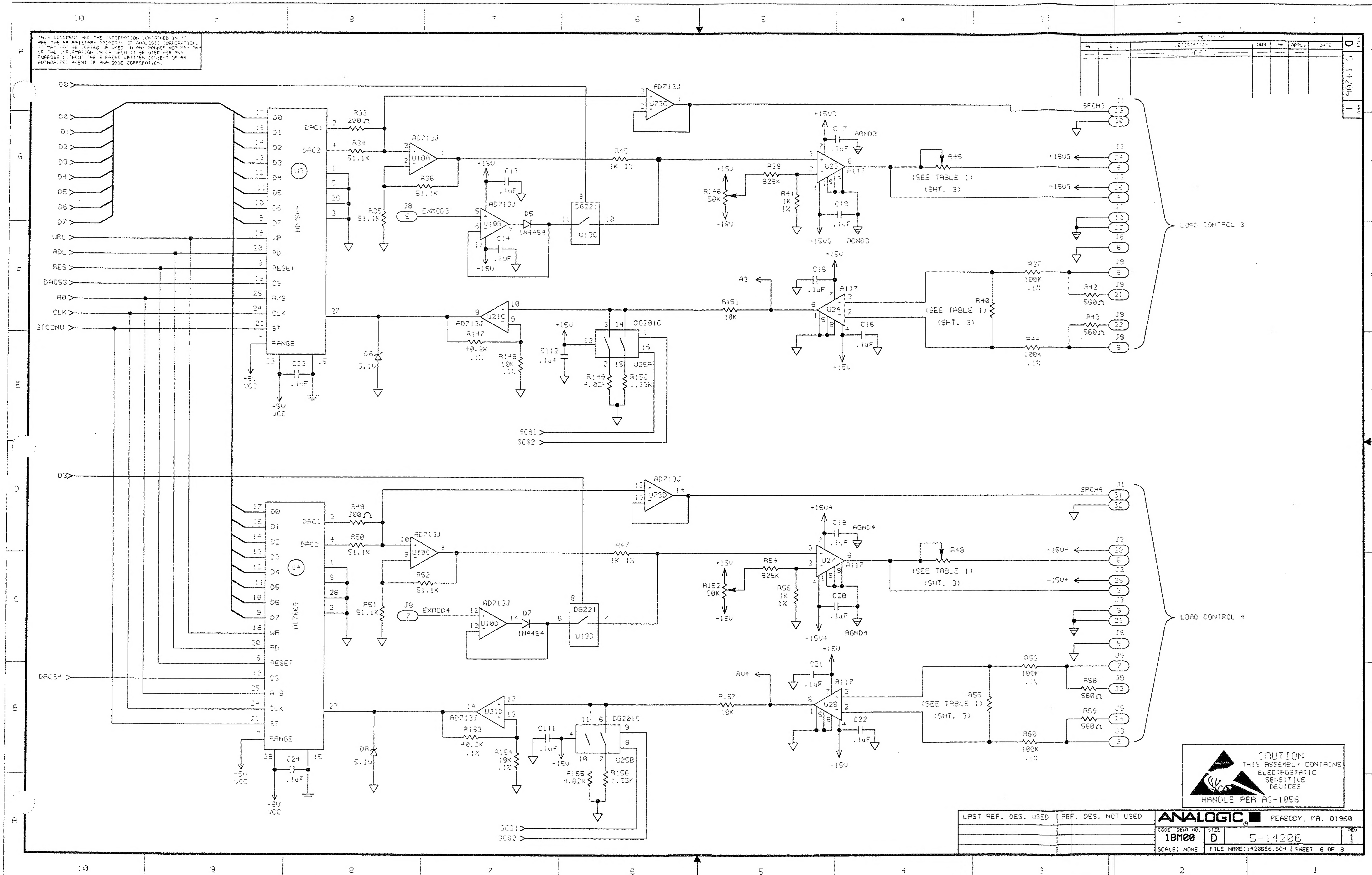
LAST REF. DES. USED | REF. DES. NOT USED

ANALOGIC PEABODY, MA. 01960
CODE IDENT NO. 1BM00 | SIZE D | 5-14206 | REV 1
SCALE: NONE | FILE NAME: 142063.SCH | SHEET 3 OF 8


U65 X2444
U62 80C32
U63 74HC373
U64 27C256 (128)
U66 MCM2018
U68 UPD7210
U70 75160
U71 75161
U69C 74HC00
U69D 74HC00
U67 74HC74
U49 74HC138
X1 11.0592 MHZ
SAVMEM
RXD
TXD
DRV0
DRV1
DRV2
STCONV
GPIBINT
RDL
WRL
RESL
RES
CLK
DACS1
DACS2
DACS3
DACS4
DACS5
DACS6
DACS7
DACS8
-15VB
AGND3
+15VB
CAUTION
THIS ASSEMBLY CONTAINS
ELECTROSTATIC
SENSITIVE
DEVICES
HANDLE PER A2-1058
LAST REF. DES. USED
REF. DES. NOT USED
ANALOGIC
PEABODY, MA. 01960
CODE IDENT NO. 1BM00
SIZE D
5-14206
REV 1
SCALE: NONE
FILE NAME: 1420654.SCH
SHEET 4 OF 8



LOAD CONTROL 1
LOAD CONTROL 2
AD7869
AD713J
DG201C
DG221
SEE TABLE 1) (SHT. 3)
SPCH1
SPCH2
EXMOD1
EXMOD2
DACS1
STCONV
SCS1
SCS2
EXM
CAUTION THIS ASSEMBLY CONTAINS ELECTROSTATIC SENSITIVE DEVICES
HANDLE PER A2-1058
LAST REF. DES. USED
REF. DES. NOT USED
ANALOGIC
PEABODY, MA. 01960
CODE IDENT NO. 1BM00
SIZE D
5-14206
REV 1
SCALE: NONE
FILE NAME:1420655.SCH
SHEET 5 OF 8



LOAD CONTROL 3
LOAD CONTROL 4
AD7569 U3
AD7569 U4
AD713J
DG221
DG201C
SEE TABLE 1 (SHT. 3)
D0 D1 D2 D3 D4 D5 D6 D7
WRL
ADL
RES
DACS3
DACS4
A0
CLK
STCONV
SCS1
SCS2
SPCH3
SPCH4
EXMOD3
EXMOD4
+15V3
-15V3
+15V4
-15V4
AGND3
AGND4
A3
AV4
CAUTION
THIS ASSEMBLY CONTAINS ELECTROSTATIC SENSITIVE DEVICES
HANDLE PER AI-1058
LAST REF. DES. USED
REF. DES. NOT USED
ANALOGIC
PEABODY, MA. 01960
CODE IDENT NO. 18M00
SIZE D
5-14206
REV 1
SCALE: NONE
FILE NAME:1430656.SCH
SHEET 6 OF 8

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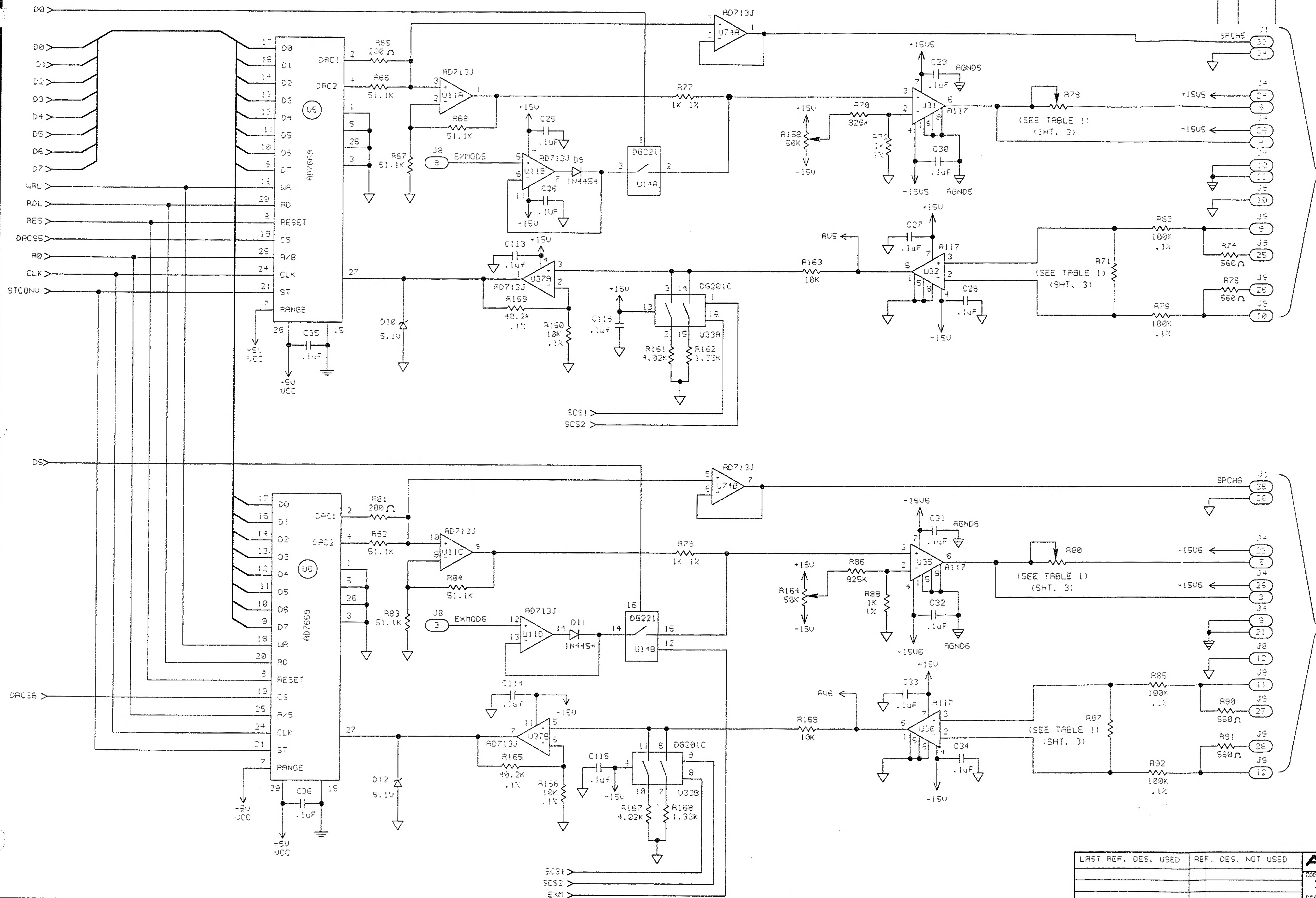
REVISIONS

RE	ECO	DESCRIPTION	DWN	CHK	APPL	DATE
		SEE SHEET 1				

SIZE D 5-14206 REV 1

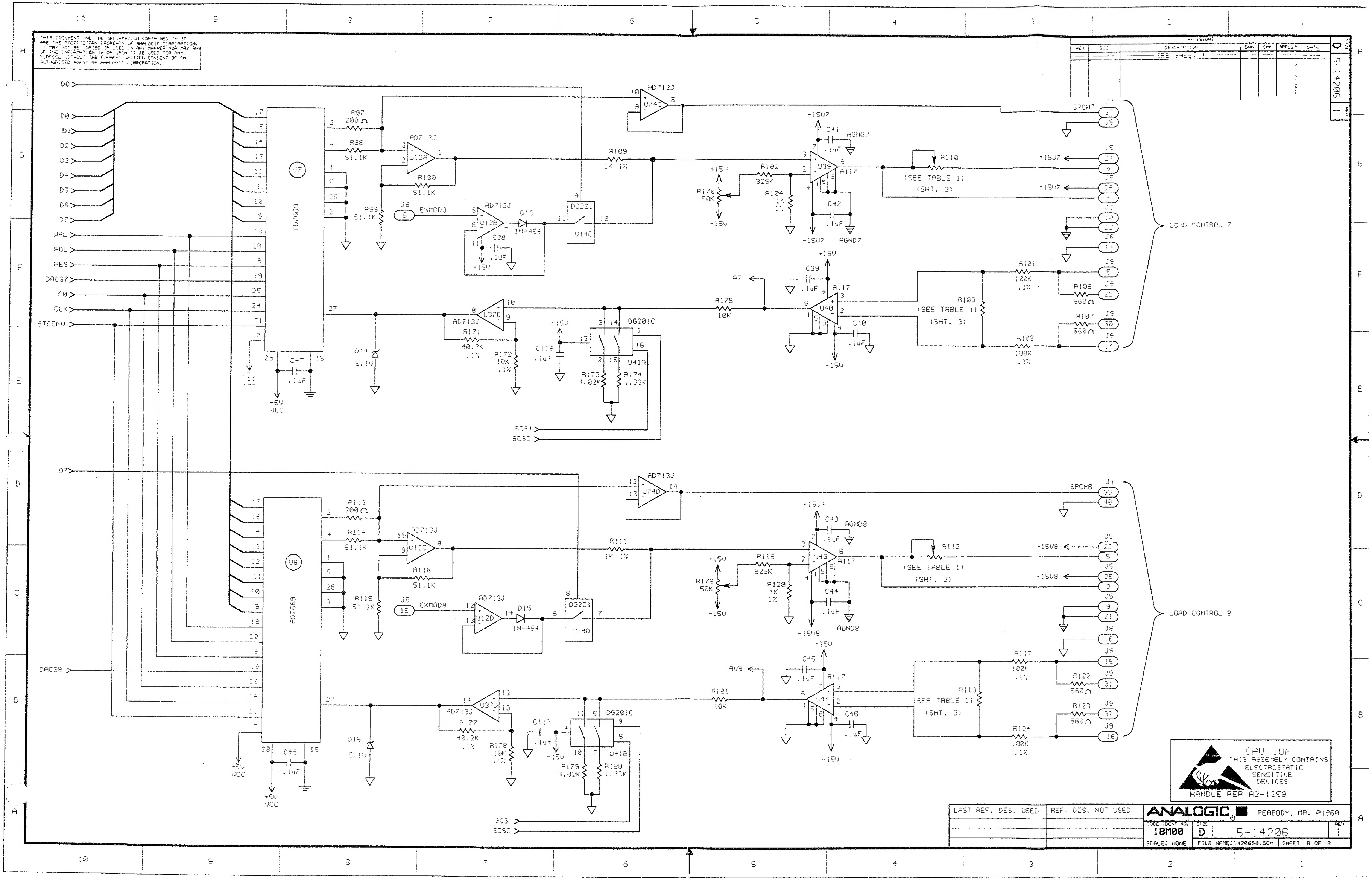


CAUTION
THIS ASSEMBLY CONTAINS ELECTROSTATIC SENSITIVE DEVICES
HANDLE PER A2-1058

LAST REF. DES. USED	REF. DES. NOT USED

ANALOGIC PEABODY, MA. 01960

CODE IDENT NO.	SIZE		REV
1BM00	D	5-14206	1
SCALE: NONE	FILE NAME: 14206S7.SCH	SHEET 7 OF 8	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REVISIONS
REV
ECO
DESCRIPTION
SEE SHEET 1
DWN
CHK
APPLS
DATE
D
5-14206
1
D0
D1
D2
D3
D4
D5
D6
D7
WRL
RDL
RES
DACS7
A0
CLK
STCONV
DACS8
U7
AD7669
U8
AD7669
R97
200 Ω
R98
51.1K
R99
51.1K
R100
51.1K
AD713J
U12A
U12B
U12C
U12D
U74C
U74D
U37C
U37D
EXMOD3
EXMOD8
D13
D15
1N4454
DG221
U14C
U14D
R109
1K 1%
R111
1K 1%
C38
C39
C40
C41
C42
C43
C44
C45
C46
C47
C48
.1uF
+5V
VCC
D14
D16
5.1V
R171
40.2K
.1%
R172
10K
.1%
DG201C
U41A
U41B
C119
C117
R173
4.02K
R174
1.33K
SCS1
SCS2
R175
10K
A7
A17
U39
U40
U43
U44
AGND7
AGND8
+15V
-15V
+15V7
-15V7
+15V8
-15V8
R102
825K
R124
1K
1%
R170
50K
R110
R112
(SEE TABLE 1)
(SHT. 3)
R101
100K
.1%
R103
R106
560 Ω
R107
560 Ω
R108
100K
.1%
SPCH7
SPCH8
J1
J5
J8
J9
LOAD CONTROL 7
LOAD CONTROL 8
R113
200 Ω
R114
51.1K
R115
51.1K
R116
51.1K
R118
825K
R120
1K
1%
R176
50K
R177
40.2K
R178
10K
R179
4.02K
R180
1.33K
R181
10K
A08
R117
100K
R119
R122
560 Ω
R123
560 Ω
R124
100K
.1%
CAUTION
THIS ASSEMBLY CONTAINS ELECTROSTATIC SENSITIVE DEVICES
HANDLE PER A2-1058
LAST REF. DES. USED
REF. DES. NOT USED
ANALOGIC
PEABODY, MA. 01960
CODE IDENT NO.
18M00
SIZE
D
5-14206
REV
1
SCALE: NONE
FILE NAME:1420658.SCH
SHEET 8 OF 8

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